

ABSTRACT OF THE DISCLOSURE

A CMOS image sensor is disclosed which can achieve reduction of the voltage used to read out signal charge and can achieve expansion of the dynamic range. A P-well region is formed on a semiconductor substrate, and an embedded photodiode, a transfer transistor, an amplification transistor, a selection transistor, a reset transistor, a floating diffusion and so forth are provided in the P-well region. Signal charge of the photodiode is transferred to the floating diffusion by operation of the transfer transistor. A substrate bias voltage in the form of a negative voltage is applied to the P-well region in synchronism with the charge transfer operation of the transfer transistor to control the potential balance between the photodiode and the transfer gate portion to reduce the voltage for charge transfer. Further, during charge storage of the photodiode, the substrate bias voltage is varied to modify the angle of the sensitivity curve to achieve expansion of the dynamic range.